Communicative rotary actuator for butterfly valves

- Torque motor Max. 90 Nm (not constant)
- Nominal voltage AC/DC 24 V
- Control modulating, communicative 2...10 V variable
- Position feedback 2...10 V variable
- Conversion of sensor signals
- Communication via Belimo MP-Bus

## Technical data

### Electrical data

- **Nominal voltage**: AC/DC 24 V
- **Nominal voltage frequency**: 50/60 Hz
- **Nominal voltage range**: AC 19.2...28.8 V / DC 21.6...28.8 V
- **Power consumption in operation**: 9 W
- **Power consumption in rest position**: 2 W
- **Power consumption for wire sizing**: 12 VA
- **Connection supply / control**: Cable 1 m, 4 x 0.75 mm²
- **Parallel operation**: Yes (note the performance data)

### Functional data

- **Torque motor**: Max. 90 Nm (not constant)
- **Communicative control**: MP-Bus
- **Operating range Y**: 2...10 V
- **Input Impedance**: 100 kΩ
- **Options positioning signal**: Open/close
- **Operating range Y variable**: Start point 0.5...30 V
- **End point 2.5...32 V**
- **Position feedback U**: 2...10 V
- **Position feedback U note**: Max. 0.5 mA
- **Position feedback U variable**: Start point 0.5...8 V
- **End point 2.5...10 V**
- **Position accuracy**: ±5%
- **Manual override**: with push-button, can be locked
- **Running time motor**: 150 s / 90°
- **Running time motor variable**: 75...290 s
- **Adaptation setting range**: manual (automatic on first power-up)
- **Adaptation setting range variable**: No action
- **Sound power level, motor**: 45 dB(A)
- **Position indication**: Mechanically (integrated)

### Safety

- **Protection class IEC/EN**: III Safety Extra-Low Voltage (SELV)
- **Protection class UL**: UL Class 2 Supply
- **Degree of protection IEC/EN**: IP54
- **Degree of protection NEMA/UL**: NEMA 2
- **Enclosure**: UL Enclosure Type 2
- **EMC**: CE according to 2014/30/EU
- **Certification IEC/EN**: IEC/EN 60730-1 and IEC/EN 60730-2-14
- **Certification UL**: cULus according to UL60730-1A, UL60730-2-14 and CAN/CSA E60730-1:02
- **Certification UL note**: The UL marking on the actuator depends on the production site, the device is UL-compliant in any case

### Mode of operation

- Type 1
- **Rated impulse voltage supply / control**: 0.8 kV
- **Control pollution degree**: 3
- **Ambient temperature**: -30...50°C
- **Storage temperature**: -40...80°C
Safety

Ambient humidity
Max. 95% r.H., non-condensing

Servicing
maintenance-free

Mechanical data
Connection flange
F05

Weight
Weight
4.2 kg

Safety notes

- This device has been designed for use in stationary heating, ventilation and air-conditioning systems and must not be used outside the specified field of application, especially in aircraft or in any other airborne means of transport.
- Outdoor application: only possible in case that no (sea) water, snow, ice, insolation or aggressive gases interfere directly with the actuator and that is ensured that the ambient conditions remain at any time within the thresholds according to the data sheet.
- Only authorised specialists may carry out installation. All applicable legal or institutional installation regulations must be complied during installation.
- The switch for changing the direction of rotation may not be adjusted.
- The angle of rotation is not permitted to be subjected to mechanical limitation. It is forbidden to alter the mechanical end stops.
- The device may only be opened at the manufacturer’s site. It does not contain any parts that can be replaced or repaired by the user.
- Cables must not be removed from the device.
- The device contains electrical and electronic components and must not be disposed of as household refuse. All locally valid regulations and requirements must be observed.

Product features

Mode of operation
Conventional operation:
The actuator is connected with a standard modulating signal of 0...10 V and drives to the position defined by the positioning signal. The measuring voltage U serves for the electrical display of the actuator position 0.5...100% and as slave control signal for other actuators.
Operation on Bus:
The actuator receives its digital positioning signal from the higher level controller via the MP-Bus and drives to the position defined. Connection U serves as communication interface and does not supply an analogue measuring voltage.

Converter for sensors
Connection option for a sensor (passive or active sensor or switching contact). The MP actuator serves as an analogue/digital converter for the transmission of the sensor signal via MP-Bus to the higher level system.

Parametrizable actuators
The factory settings cover the most common applications. Single parameters can be modified with the Belimo Service Tools MFT-P or ZTH EU.

Simple direct mounting
Simple direct mounting on the butterfly valve. The mounting orientation in relation to the butterfly valve can be selected in 90° (angle) increments.

Manual override
Manual override with push-button possible (the gear is disengaged for as long as the button is pressed or remains locked).

High functional reliability
The actuator is overload protected, requires no limit switches and automatically stops when the end stop is reached.

Combination valve/actuator
For valves with the following mechanical specifications in accordance with ISO 5211 F05:
- Square stem head SW = 14 mm for form-fit coupling of the rotary actuator.
- Hole circle d = 50 mm

Home position
The first time the supply voltage is switched on, i.e. at the time of commissioning, the actuator carries out an adaption, which is when the operating range and position feedback adjust themselves to the mechanical setting range.
The actuator then moves into the position defined by the positioning signal.
Factory setting: Y2 (counter-clockwise rotation).
Adaption and synchronisation

An adaption can be triggered manually by pressing the “Adaption” button or with the PC-Tool. Both mechanical end stops are detected during the adaption (entire setting range).

Automatic synchronisation after pressing the gearbox disengagement button is configured. The synchronisation is in the home position (0%).

The actuator then moves into the position defined by the positioning signal.

A range of settings can be adapted using the PC-Tool (see MFT-P documentation).

Torque not constant

Due to the non-linear torque characteristic the actuator can only be used for butterfly valves and not for other armatures.

![Torque Graph]

Accessories

<table>
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<tr>
<th>Description</th>
<th>Type</th>
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</thead>
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<td>Gateways</td>
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<tr>
<td>Gateway MP zu BACnet MS/TP</td>
<td>UK24BAC</td>
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<td>Gateway MP to Modbus RTU</td>
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<td>Gateway MP to LonWorks</td>
<td>UK24LON</td>
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<tr>
<td>Gateway MP to KNX</td>
<td>UK24EIB</td>
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<td>Electrical accessories</td>
<td></td>
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<tr>
<td>Auxiliary switch 1 x SPDT add-on</td>
<td>S1A</td>
</tr>
<tr>
<td>Auxiliary switch 2 x SPDT add-on</td>
<td>S2A</td>
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<tr>
<td>Feedback potentiometer 140 Ω add-on</td>
<td>P140A</td>
</tr>
<tr>
<td>Feedback potentiometer 200 Ω add-on</td>
<td>P200A</td>
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<tr>
<td>Feedback potentiometer 500 Ω add-on</td>
<td>P500A</td>
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<tr>
<td>Feedback potentiometer 1 kΩ add-on</td>
<td>P1000A</td>
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<tr>
<td>Feedback potentiometer 2.8 kΩ add-on</td>
<td>P2800A</td>
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<td>Feedback potentiometer 5 kΩ add-on</td>
<td>P5000A</td>
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<tr>
<td>Feedback potentiometer 10 kΩ add-on</td>
<td>P10000A</td>
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<tr>
<td>Connection cable 5 m, A: RJ11 6/4 ZTH EU, B: 6-pin service socket for Belimo device</td>
<td>ZK1-GEN</td>
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<tr>
<td>Connection cable 5 m, A: RJ11 6/4 ZTH EU, B: free wire end for connection to MP/PP terminal</td>
<td>ZK2-GEN</td>
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<tr>
<td>Connecting board MP-Bus for wiring boxes EXT-WR-FP..-MP</td>
<td>ZFP2-MP</td>
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<td>MP-Bus power supply for MP actuators</td>
<td>ZN230-24MP</td>
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<td>Service Tools</td>
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<td>Service Tool, Setting tool with ZIP-USB function</td>
<td>ZTH EU</td>
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<tr>
<td>Belimo PC-Tool, Software for adjustments and diagnostics</td>
<td>MFT-P</td>
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<tr>
<td>Adapter for Service-Tool ZTH</td>
<td>MFT-C</td>
</tr>
</tbody>
</table>

Electrical installation

- Connection via safety isolating transformer.
- Parallel connection of other actuators possible. Observe the performance data.
Electrical installation

Wiring diagrams

AC/DC 24 V, modulating

Operation on the MP-Bus

Cable colours:
1 = black
2 = red
3 = white
5 = orange

Functions

Functions when operated on MP-Bus

Connection on the MP-Bus

MP-Bus Network topology

There are no restrictions for the network topology (star, ring, tree or mixed forms are permitted). Supply and communication in one and the same 3-wire cable • no shielding or twisting necessary • no terminating resistors required

Connection of active sensors

A) more actuators and sensors (max. 8)
• Supply AC/DC 24 V
• Output signal DC 0...10 V (max. DC 0...32 V)
• Resolution 30 mV

Connection of external switching contact

A) more actuators and sensors (max. 8)
• Switching current 16 mA @ 24 V
• Start point of the operating range must be parameterised on the MP actuator as ≥ 0.5 V

Connection of passive sensors

A) more actuators and sensors (max. 8)
1) Depending on the type
2) Resolution 1 Ohm

Ni1000 -28...+98°C 850...1600 Ω
Pt1000 -55...+155°C 850...1600 Ω
Ntc -10...+160°C 200 Ω...60 kΩ

Sensor

MP

A)

Cable colours:
1 = black
2 = red
3 = white
5 = orange

Y

U

DC (0)2…10 V

DC 2…10 V

Y

U

1 2 3 5

– +

T ~

DR24A-MP-5

Rotary actuator, modulating, communicative, AC/DC 24 V, 90 Nm, Communication via Belimo MP-Bus

www.belimo.com
Functions

Functions with basic values (conventional mode)

Override control with AC 24 V with relay contacts

Override control with AC 24 V with rotary switch

Control remotely 0...100% with positioner SG..

Minimum limit with positioner SG..

Follow-up control (position-dependent)

Control with 4...20 mA via external resistor

Caution:
The operating range must be set to DC 2...10 V.
The 500 Ω resistor converts the 4...20 mA current signal to a voltage signal DC 2...10 V

Functional check

Procedure
1. Connect 24V to connections 1 and 2
2. Disconnect connection 3:
   – with direction of rotation Y1: Actuator rotates to the left
   – with direction of rotation Y2: Actuator rotates to the right
3. Short-circuit connections 2 and 3:
   – Actuator runs in opposite direction
### Functions

#### Functions for devices with specific parameters (Parametrisation necessary)

Override control and limiting with AC 24 V with relay contacts

Override control and limiting with AC 24 V with rotary switch

1) **Caution:** This function is only guaranteed if the start point of the operating range is defined as min. 0.5 V.

### Operating controls and indicators

2. **Push-button and LED display green**
   - **Off:** No power supply or malfunction
   - **On:** In operation
   - **Press button:** Triggers angle of rotation adaptation, followed by standard mode

3. **Push-button and LED display yellow**
   - **Off:** Standard mode
   - **Flickering:** MP communication active
   - **On:** Adaptation or synchronising process active
   - **Flashing:** Request for addressing from MP master
   - **Press button:** Confirmation of the addressing

4. **Gear disengagement button**
   - **Press button:** Gear disengages, motor stops, manual override possible
   - **Release button:** Gear engages, synchronisation starts, followed by standard mode

5. **Service plug**
   - For connecting parameterisation and service tools

**Check power supply connection**

- **2 Off and 3 On:** Possible wiring error in power supply
Service

Service Tools connection

The actuator can be parametrised by ZTH EU via the service socket. For an extended parametrisation the PC tool can be connected.

Connection ZTH EU / PC-Tool

Dimensions [mm]

Dimensional drawings
Further documentation

- Overview MP Cooperation Partners
- Tool connections
- Introduction to MP-Bus Technology
- The complete product range for water applications
- Data sheets for ball valves
- Installation instructions for actuators and/or ball valves
- General notes for project planning